# REPORT OF INVESTIGATIONS

## PONCE
## CENTER FOR ENVIRONMENTAL CONTROL
## CO-DISPOSAL AREA

Prepared For

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May 1, 1984

TABLE OF CONTENTS

## LIST OF FIGURES



## LIST OF TABLES

## 1.0 INTRODUCTION

This report presents data and interpretations of data collected to date in the co-disposal area of the Ponce Center for Environmental Control. The sources of these data are summarized as follows:

- soil test borings and analytical results performed as part of the investigation of the former S K and F lagoons (borings C-16 through C-20)
- soil test borings and analytical results of the co-disposal investigation (CA series borings)
- soil test borings performed for geotechnical purposes (C-22 through C-87)
- site characterization borings C-3 and C-6
- soil test boring and analytical results for monitoring well MW-5
- composite samples collected along roadway excavations and analytical results for these samples
- electromagnetic conductivity, resistivity and seismic refraction geophysical techniques to assist in the evaluation of the three-dimensional geometry of waste fill materials

Some of the data listed above were collected for the specific purpose of investigating the co-disposal area to meet consent order requirements (Consent Order Decree - Docket No. II RCRA-82-0301). These data include boring logs and analytical results associated with the CA - series borings, composite sampling along roadway excavation and the drilling and sampling of monitoring well MW-5.

The other activities listed were performed for other purposes but yielded data regarding thickness of waste materials, which have been utilized for characterizing the co-disposal area in this report. Table 1 lists the data sources and types of data used in preparation of this report.

TABLE 1

Data Types and Sources

| Investigation | Data | | Use in this report |
|---|---|---|---|
| | Source | Product | |
| Soil test borings for geotechnical purposes | STB C-22 through C-87 performed in roadways, proposed process facility area and planned processed facility area | boring logs | thickness of waste fill material; characterization of residual material |
| Site characterization borings | C-3 and C-6 | boring logs | thickness of waste fill material; characterization of residual material |
| SK and F lagoon study borings | C-16 through C-20 | boring logs and analytical results | thickness of waste fill material; characterization of residual material and chemical characteristics of waste fill materials |

TABLE 1
(continued)

Data Types and Sources

| Investigation | Data | | Use in this report |
|---|---|---|---|
| | Source | Product | |
| Installation of monitoring well MW-5 | Drilling MW-5 | boring logs and analytical results | thickness of waste fill and chemical characteristics of perched water |
| Co-disposal investigation borings | CA-1 through CA-8 | boring logs and analytical results | thickness and chemcial characteristics of waste fill materials |
| Roadway excavation sampling program | Sampling | fill description and analytical results | chemical characteristics of fill materials |
| Geophysical techniques: electromagnetic conductivity resistivity and seismic refraction | Geophysical Surveys | geophysical logs | three dimensional geometry of co-disposal waste fill materials |

# 2.0 FIELD PROGRAMS AND DISCUSSION

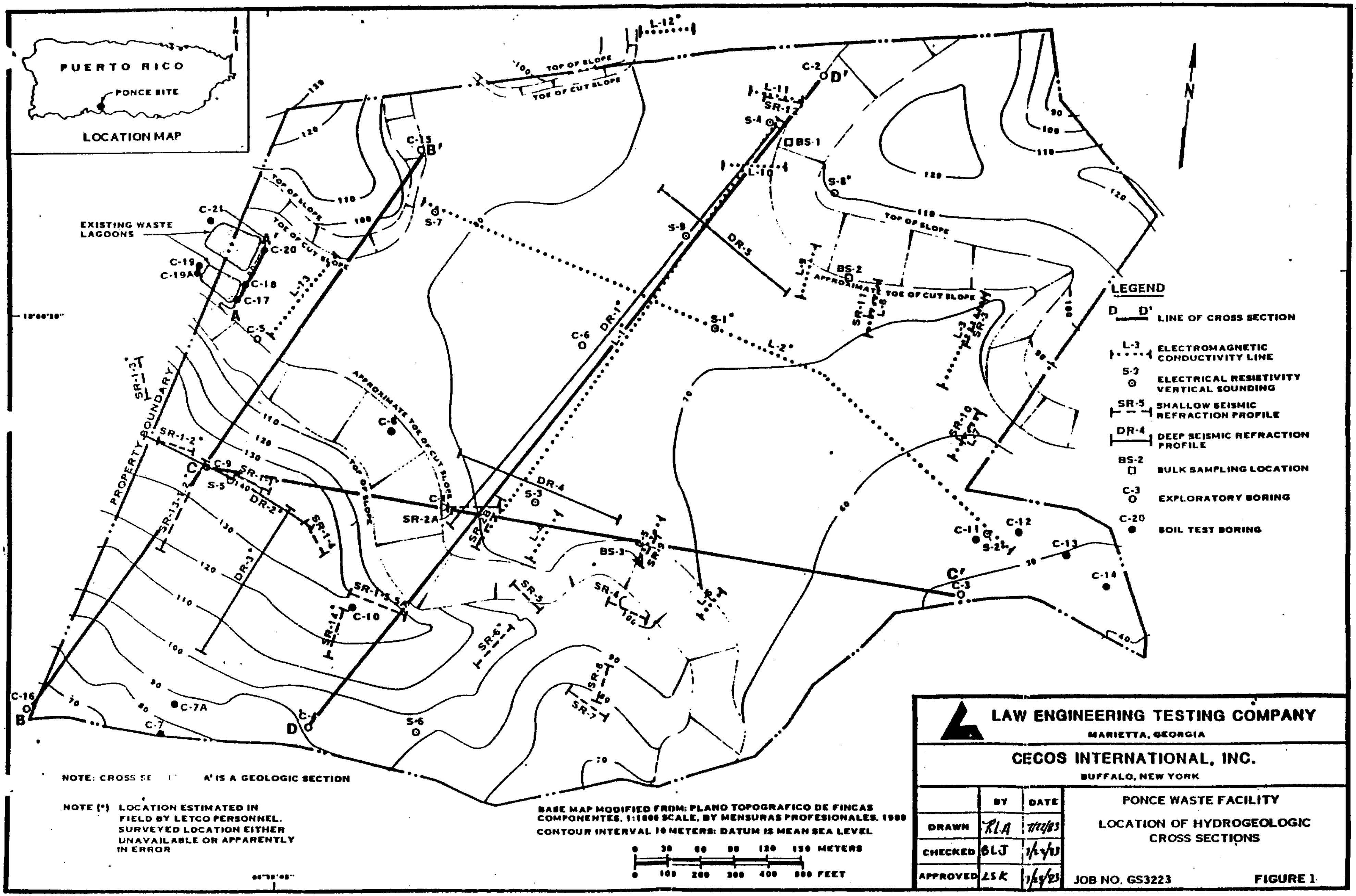
## 2.1 Geophysics

During initial site characterization activities, surface geophysical techniques were used to evaluate the thickness of lateral extent of waste fill materials in the co-disposal area. The techniques included electromagnetic conductivity surveys, resistivity soundings and seismic refraction profiling. The location of geophysical investigations are shown on Figure 1. Geophysical profiles are presented in Appendix A.

The interpretation of the results of these activities indicated the lateral boundaries of waste fill. Thickness of waste fill materials were interpreted to gradually increase away from the margins to a probable maximum thickness of 65 feet.

Seismic refraction data indicated waste fill thinned around a seismic velocity anomaly centered around the present location of boring C-6 (see Figure 2). Boring C-6 was performed to assist in evaluating the cause and nature of this anomaly.

At boring C-6 waste fill was encountered to a depth of approximately 25 feet. Based on conversations with long-term employees of the Ponce Vertedero it was determined that a former topographic high existed in the area of the seismic velocity anomaly. A review of aerial photographs dating back to 1936 confirmed the presence of a small hill in this area.


PUERTO RICO
PONCE SITE
LOCATION MAP
EXISTING WASTE LAGOONS
TOP OF SLOPE
TOE OF CUT SLOPE
APPROXIMATE TOE OF CUT SLOPE
PROPERTY BOUNDARY
N
LEGEND
D D' LINE OF CROSS SECTION
L-3 ELECTROMAGNETIC CONDUCTIVITY LINE
S-3 ELECTRICAL RESISTIVITY VERTICAL SOUNDING
SR-5 SHALLOW SEISMIC REFRACTION PROFILE
DR-4 DEEP SEISMIC REFRACTION PROFILE
BS-2 BULK SAMPLING LOCATION
C-3 EXPLORATORY BORING
C-20 SOIL TEST BORING
NOTE: CROSS SE A' IS A GEOLOGIC SECTION
NOTE (*) LOCATION ESTIMATED IN FIELD BY LETCO PERSONNEL. SURVEYED LOCATION EITHER UNAVAILABLE OR APPARENTLY IN ERROR
BASE MAP MODIFIED FROM: PLANO TOPOGRAFICO DE FINCAS COMPONENTES, 1:1000 SCALE, BY MENSURAS PROFESIONALES, 1980
CONTOUR INTERVAL 10 METERS: DATUM IS MEAN SEA LEVEL
0 30 60 90 120 150 METERS
0 100 200 300 400 500 FEET
LAW ENGINEERING TESTING COMPANY
MARIETTA, GEORGIA
CECOS INTERNATIONAL, INC.
BUFFALO, NEW YORK
BY DATE
DRAWN RLA 7/22/83
CHECKED BLJ 7/23/83
APPROVED LSK 7/23/83
PONCE WASTE FACILITY
LOCATION OF HYDROGEOLOGIC CROSS SECTIONS
JOB NO. GS3223
FIGURE 1

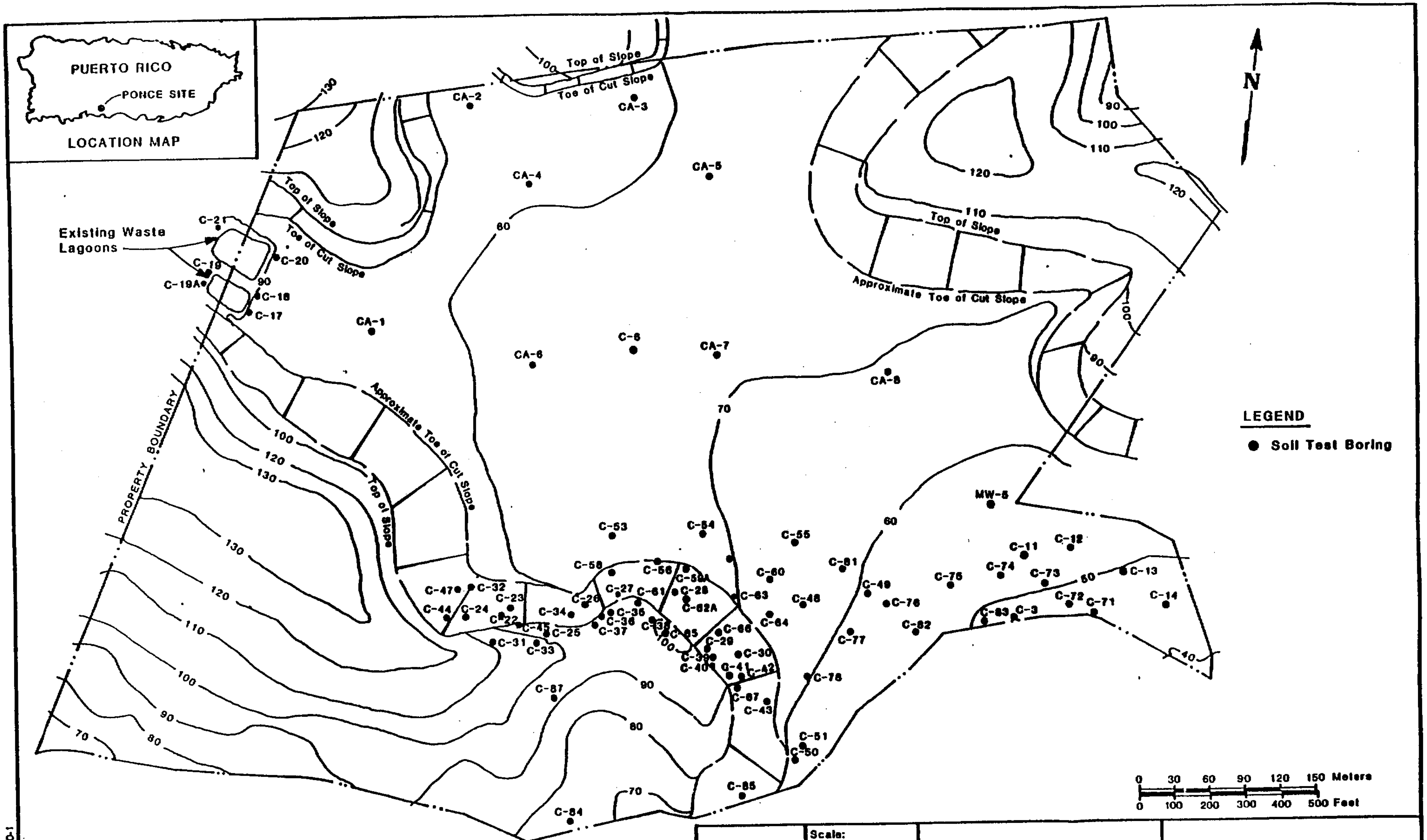
This hill was excavated to provide more space for landfilling. Beneath present waste fill, natural materials still form a localized high area and has been interpreted as being the cause of the seismic velocity anomaly.

This interpretation was confirmed by the results obtained during drilling of boring C-6. An isopach map showing thickness of waste fill in the co-disposal area is shown on Figure 3 and also supports the interpretations of the geophysical data. Lateral boundaries of waste fill are shown on Figure 4.

## 2.2 Geotechnical Soil Test Borings

For site facilities development purposes, fifty-six geotechnical soil test borings have been drilled within the co-disposal area. These borings were performed to provide data for engineering design purposes and for this reason are confined in areal extent to the southern portion of the co-disposal area (Figure 2).

These borings encountered thicknesses of waste fill ranging from zero to fifty-four feet. In general, waste fill thickness increased from south to north with distance away from the margins of the co-disposal area. The waste fill materials encountered were typical of municipal landfill wastes.




Base Map Modified From: Law Engineering Testing Company - Marietta, Georgia, Job. No.. GS3223

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BUFFALO, NEW YORK

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| Ckd. | | |
| Ap'vd. | | |
| Rev. | | |

PONCE WASTE FACILITY

SOIL TEST BORINGS

Project No. 4C002153

B

FIGURE 2

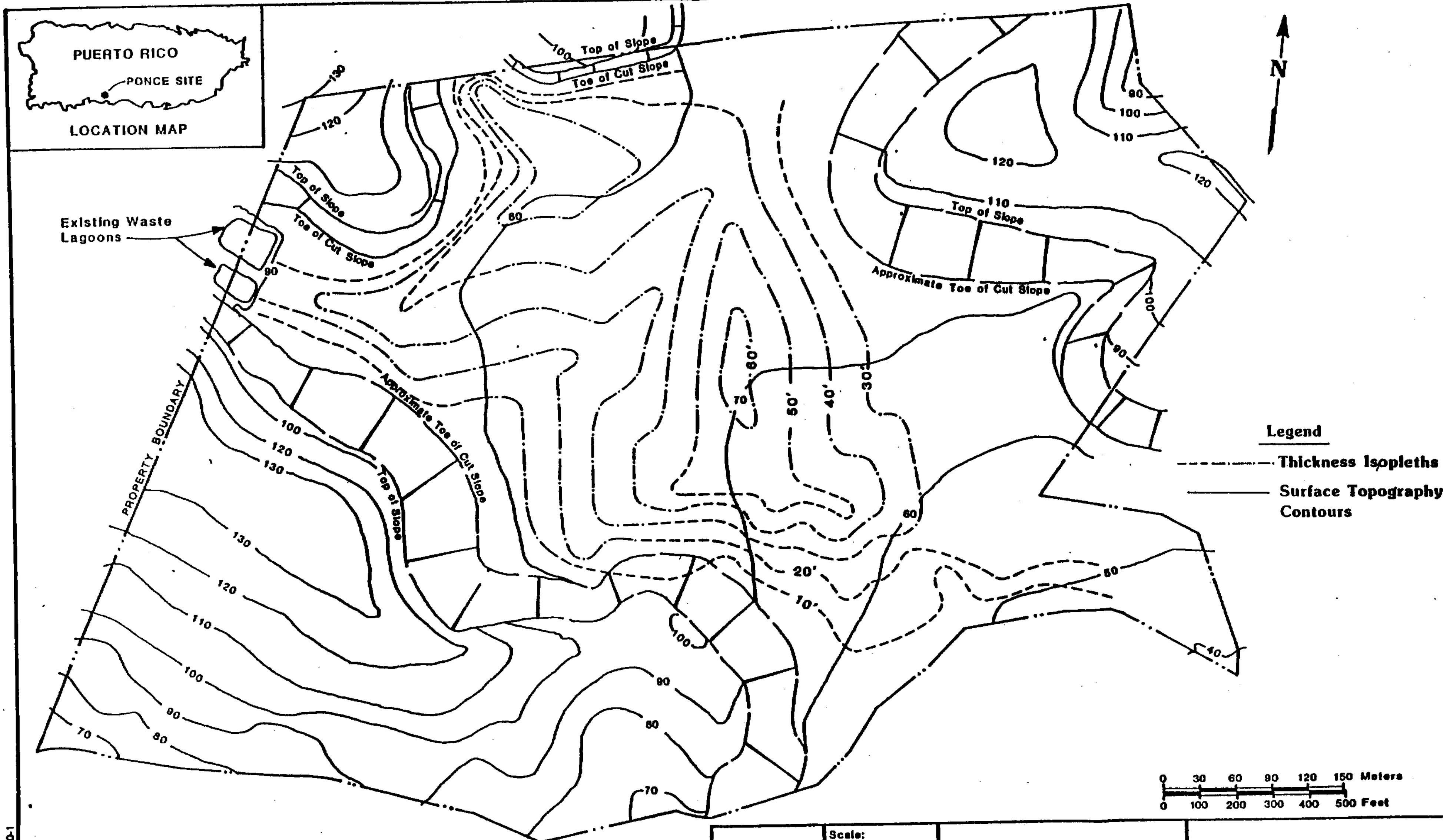
BRUNING 44-131 61160-1

The methods of landfilling involved compacting waste receipts at the end of each day and covering these materials with compacted earthen fill. The soil test borings encountered these layers of earthen fill and were noted when the sampling interval depth corresponded to one of these layers.

The majority of the soil test borings terminated in residual material. A boring was terminated when approximately five feet of residual material had been continously encountered in a borehole. Borings performed to determine the location of the margin of waste fill were at times terminated when the presence of waste fill was determined. Waste fill in these areas is generally less than five feet in thickness. Two borings, C-54 and C-73 encountered alluvial materials underlying waste fill. Boring C-54 encountered 15.5 feet of alluvium and was terminated. Boring C-73 encountered 7.5 feet of alluvium and was terminated in residual material.

Where encountered, perched water was noted on the boring log. Generally, perched water conditions were confined to a single lift of waste fill. Perched zones were not continuous either vertically or laterally. Boring logs for the geotechnical soil test borings are presented in Appendix B-1.

Using the data obtained during drilling of the geotechnical borings and other borings performed in the co-disposal area (see Figure 2) an isopach map has been prepared. Figure 3 shows the isopachs associated with waste fill materials in the co-disposal area. Each contour line represents points of equal thickness of waste fill as interpreted from the boring

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PONCE WASTE FACILITY

WASTE - FILL ISOPACH
Contour Interval 10'

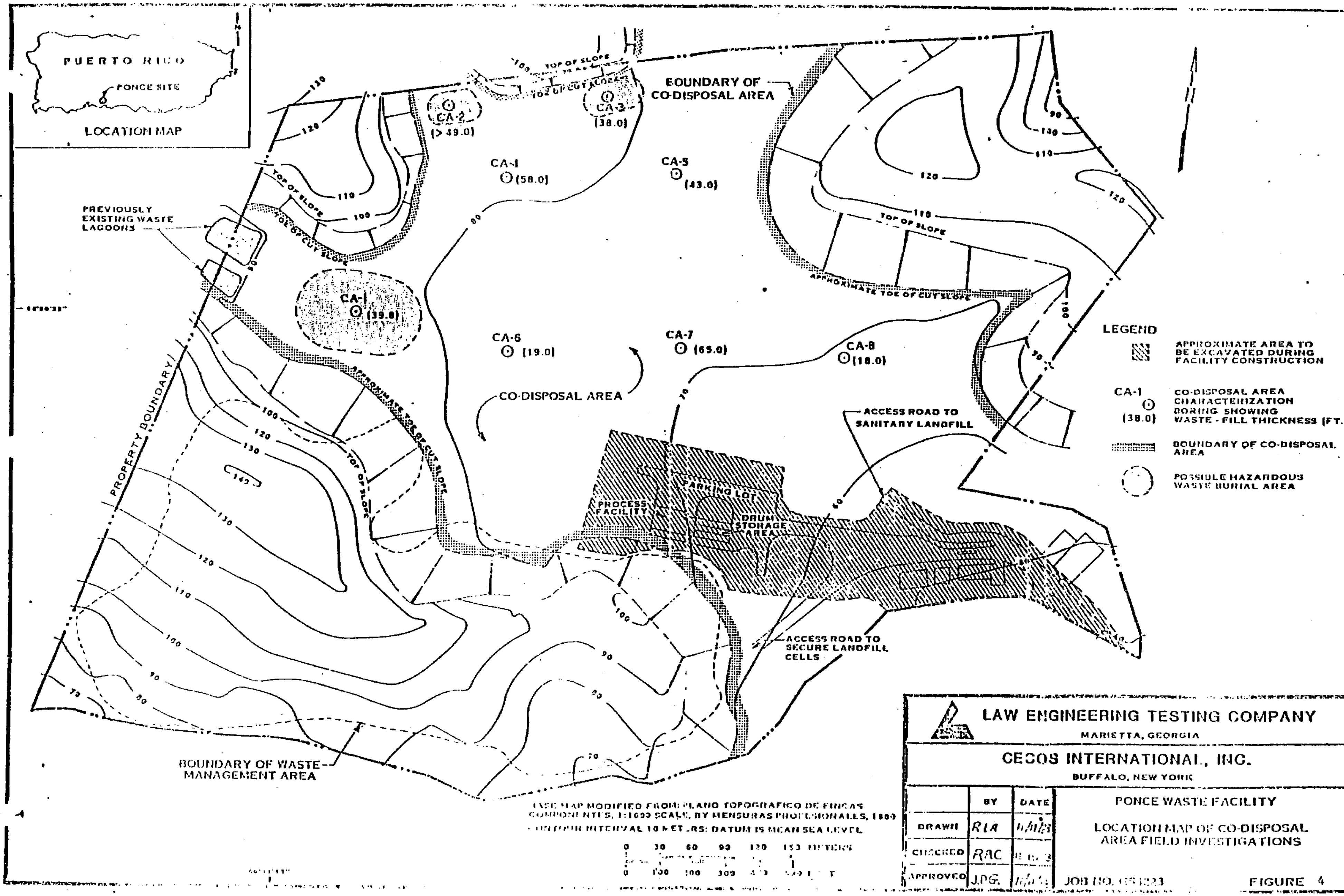
Project No. 4C002153

B

FIGURE 3

Base Map Modified From: Law Engineering Testing Company - Marietta, Georgia, Job. No. GS3223

BRUNING 44-131 61160-1


PUERTO RICO
PONCE SITE
LOCATION MAP
BOUNDARY OF CO-DISPOSAL AREA
CA-2 (>39.0)
CA-3 (38.0)
CA-4 (58.0)
CA-5 (43.0)
PREVIOUSLY EXISTING WASTE LAGOONS
CA-1 (39.8)
CA-6 (19.0)
CA-7 (65.0)
CA-8 (18.0)
CO-DISPOSAL AREA
TOP OF SLOPE
TOE OF CUT SLOPE
APPROXIMATE TOE OF CUT SLOPE
PROPERTY BOUNDARY
ACCESS ROAD TO SANITARY LANDFILL
PARKING LOT
PROCESS FACILITY
DRUM STORAGE AREA
ACCESS ROAD TO SECURE LANDFILL CELLS
BOUNDARY OF WASTE MANAGEMENT AREA
LEGEND
APPROXIMATE AREA TO BE EXCAVATED DURING FACILITY CONSTRUCTION
CA-1 (38.0) CO-DISPOSAL AREA CHARACTERIZATION BORING SHOWING WASTE - FILL THICKNESS (FT.)
BOUNDARY OF CO-DISPOSAL AREA
POSSIBLE HAZARDOUS WASTE BURIAL AREA
BASE MAP MODIFIED FROM: PLANO TOPOGRAFICO DE FINCAS COMPONENTES, 1:1000 SCALE, BY MENSURAS PROFESIONALES, 1980
CONTOUR INTERVAL 10 METERS: DATUM IS MEAN SEA LEVEL
0 30 60 90 120 150 METERS
LAW ENGINEERING TESTING COMPANY
MARIETTA, GEORGIA
CECOS INTERNATIONAL, INC.
BUFFALO, NEW YORK
BY DATE
DRAWN RLA
CHECKED RAC
APPROVED JPG.
PONCE WASTE FACILITY
LOCATION MAP OF CO-DISPOSAL AREA FIELD INVESTIGATIONS
FIGURE 4

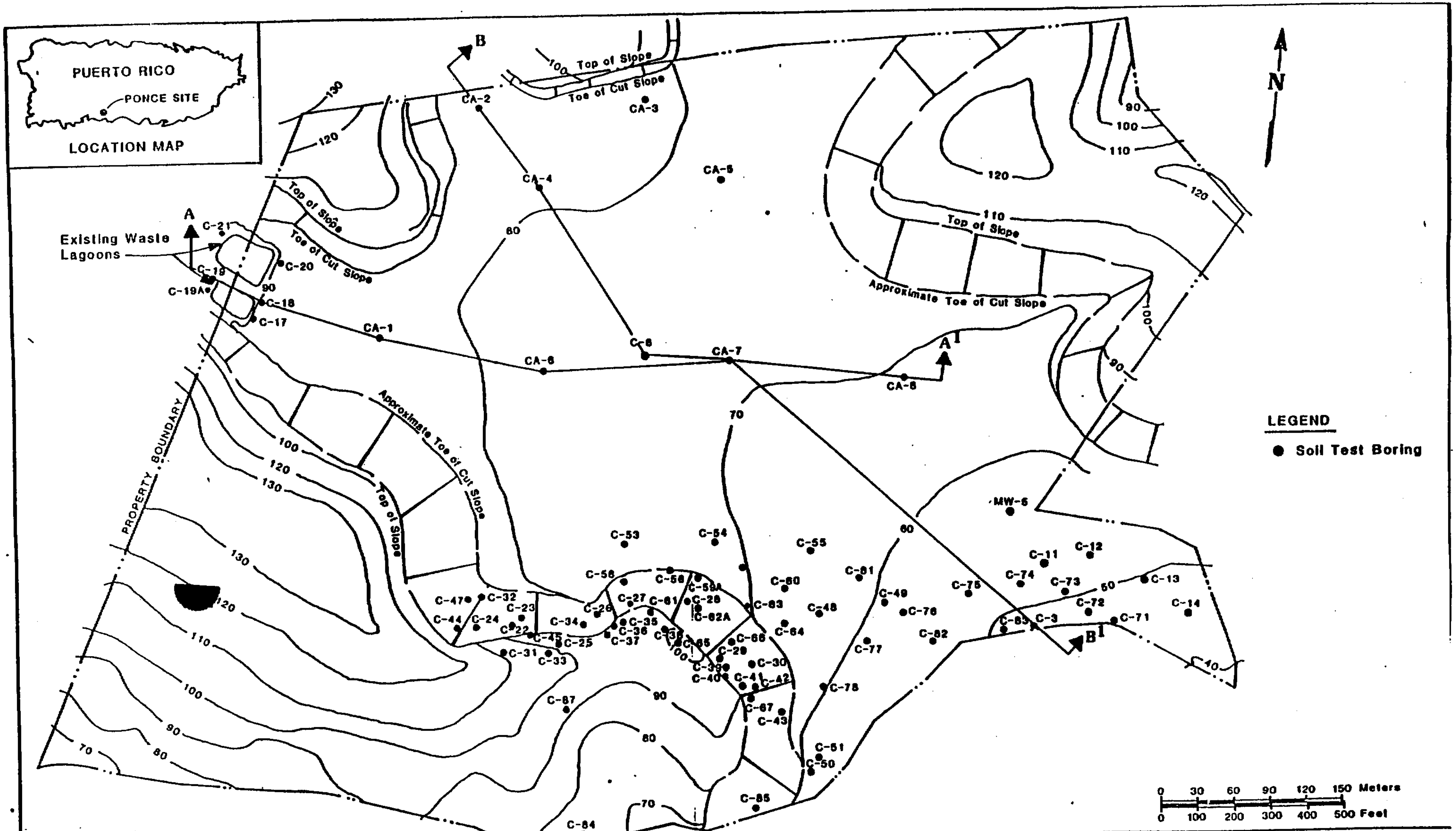
data. The greatest thickness of waste fill occurs in the central portion of the co-disposal area. In general, waste fill materials thin away from this central high. The isopachs are in good agreement with interpretations of the geophysical data and with interpretations of pre-disposal topography using aerial photographs. Cross sections through the co-disposal area are shown on Figures 6 and 7. The locations of the cross sections are shown on Figure 5.

## 2.3 SK and F Lagoon Study Borings

Six soil test borings were performed in the area of the former SK and F lagoons as part of closure activities. Boring locations are shown on Figure 2. These borings were drilled at a time when waste materials were present in one of the lagoons.

The borings encountered thicknesses of waste fill material ranging from eighteen to twenty-seven feet. All borings terminated in residual materials. One boring, C-17, encountered 1.5 feet of alluvium prior to encountering residual materials.

The former lagoons and associated waste materials have been excavated as part of closure activites. During this process waste fill materials underlying the lagoon were also excavated. Thirty-six borings were performed within the area boundaries of the former lagoons subsequent to excavation activities. None of these borings encountered waste fill materials to the depths drilled. Details of the closure activities associated with these lagoons are presented in a separate report entitled "Closure Activities Associated with SK and F Surface Impoundments Ponce

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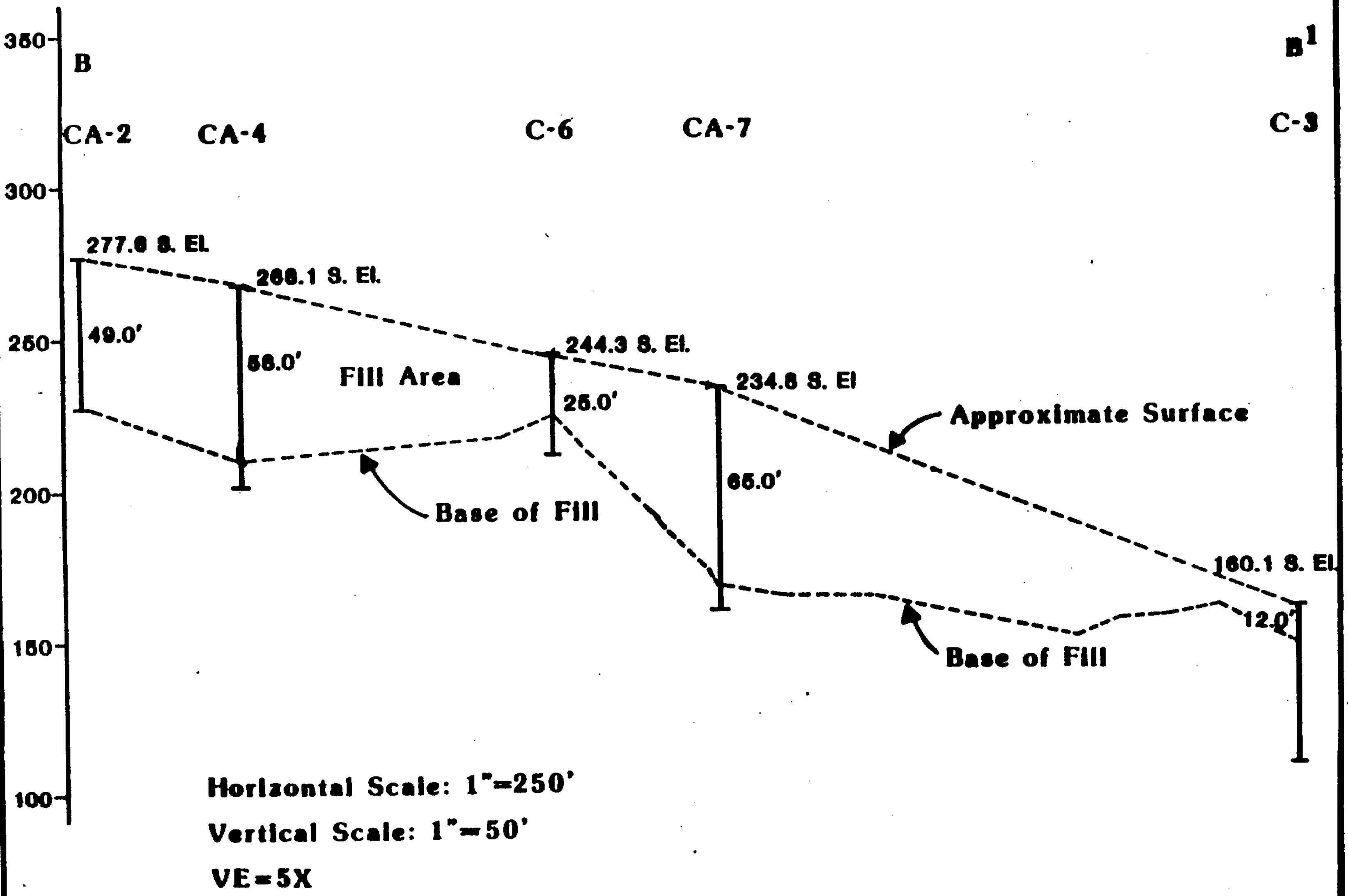
Project No. 4C002153

SOIL TEST BORINGS (Cross Section Locations A-A1, B-B1)

B

FIGURE 5

BRUNING 44-131 61160-1

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Ponce Waste Management Facility

Ponce, Puerto Rico

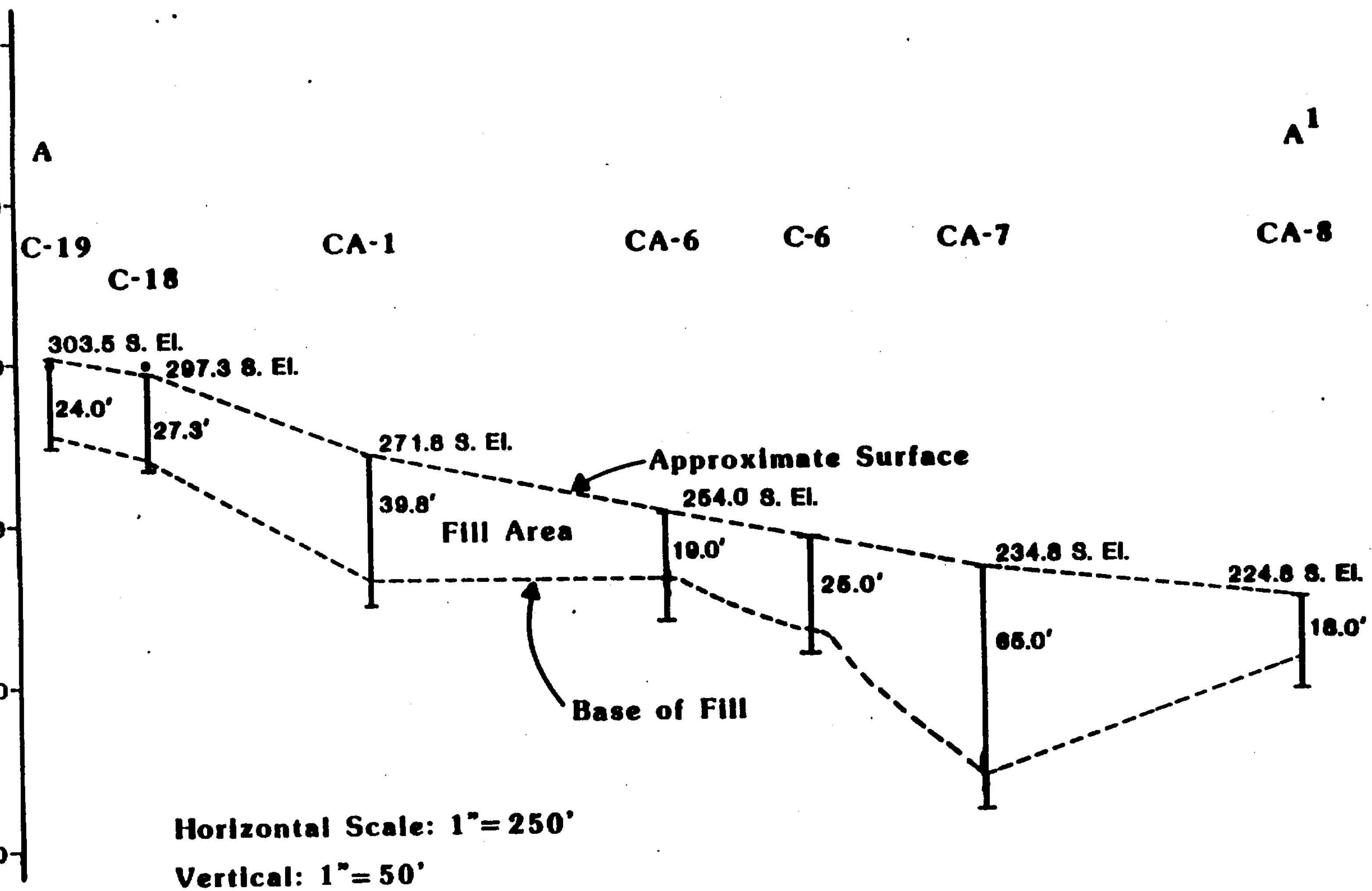
Project No. 4C002153

CROSS SECTION

B - B1

A

FIGURE 6




Horizontal Scale: 1" = 250'

Vertical: 1" = 50'

VE = 5X

BRUNING 44-13 .60-1

RECRA RESEARCH INC.
BUFFALO, NEW YORK

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Ponce Waste Management Facility

Ponce, Puerto Rico

Project No. 4C002153

Cross Section

A - A[1]

A

FIGURE 7

Waste Management Facility," Recra Research, 1984.

Soil samples obtained after excavation of impoundment materials were analyzed for selected parameters. The results indicate residual materials underlying the former lagoons contain small amounts of total cyanide. Total cyanide results for these materials are higher than cyanide results for background samples. Analytical results for these samples are presented in Appendix C-1.

## 2.4 Co-Disposal Investigation Borings

A total of eight soil test borings were completed as part of the investigation of the co-disposal area. The purpose of these borings was to evaluate thickness of waste fill materials, perched water conditions within the co-disposal area, and to provide samples of waste fill materials for laboratory analyses.

Three of the eight soil test borings (CA-1 through CA-3) were drilled in areas suspected as potentially having received hazardous wastes or liquid wastes (Figure 4). These locations were determined by discussions with long-time employees of the landfill and by examination of aerial photographs which indicated disposal of liquid wastes had occurred.

The remaining five borings (CA-4 through CA-8) were drilled at locations selected to provide good areal coverage across the co-disposal area, north of the area which had extensive boring coverage resulting from geotechnical investigations.

A detailed discussion of the field investigation program associated with the drilling of the CA-series borings including boring logs is contained in Law Engineerings report entitled "Ponce Waste Facility Co-Disposal Landfill Exploration Final Report," which is included in the Appendix B-3.

The depth of the waste-fill was determined at all boring locations except CA-2, which was terminated above the bottom of fill due to refusal on a hard object in the fill. Waste-fill depths ranged from 18 feet at CA-8 to 65 feet at CA-7. The shallow fill depth of 19 feet at boring CA-6 indicates the presence of a ridge on the old valley floor that has been covered by the landfilling operation. This ridge was also encountered in boring C-6 drilled during the hydrologic and geologic site characterization investigation performed in spring of 1983. The waste-fill depths at the boring locations generally agree with the fill depths determined by geophysical methods and test borings during other investigations (see Section 2.2). The locations of cross sections through the co-disposal area are shown on Figure 5. The cross sections are shown on Figures 6 and 7.

The waste-fill encountered in the investigation was predominantly municipal-type waste mixed with earthen cover of varying soil types. The municipal waste was composed largely of wood, paper, fabric and miscellaneous other types of trash and garbage. The soil cover was typically a fine sandy silty clay or silty sand with occasional limestone fragments.

Borings CA-1, CA-2, and CA-3, which were located in areas where the existence of buried hazardous waste was considered most likely, did not encounter obvious signs of hazardous material. Boring CA-1 was drilled in an area in which burial of asbestos-containing materials was suspected. The materials sampled from this boring were predominantly paper, wood, and cardboard wastes similar to that encountered elsewhere on the site. Borings CA-2 and CA-3 were drilled in areas where aerial photographs had indicated liquid waste disposal. These borings encountered conditions, as discussed in the following paragraph, which were unusual in comparison to other locations. However, the presence of hazardous material in these borings could not be determined on the basis of visual examination of the samples.

Unusual conditions in the waste-fill were encountered at two locations during the investigation. In boring CA-2, a zone of very high gas production was encountered at 44 to 46 feet below ground surface. Explosive gases (presumably methane) were detected with an explosimeter as far as 15 feet downwind of the boring location, with explosive concentrations being measured as far as 4 feet from the borehole. In boring CA-3, a zone of wastes from a local tuna packing plant was encountered. These wastes were identified by their unusual texture and very strong odor. However, the quantity of explosive gas detected by explosimeter from this zone was relatively small.

Perched water conditions in the waste-fill were encountered in most of the borings. Perched water was encountered at relatively shallow depths (less than 20 feet below ground surface) in borings CA-1, CA-5, CA-6, and CA-8. The saturated zone exceeded 10 feet in thickness in borings CA-1 and CA-6 but was less than 5 feet thick in borings CA-5 and CA-8. Deeper perched water zones were encountered in borings CA-1, CA-2, and CA-3.

The saturated zones in borings CA-1 and CA-3 were less than 5 feet in thickness. The thickness of the saturated zone in boring CA-2 was not determined because the boring was terminated within the saturated zone. The deep perched water zones in borings CA-1 and CA-3 were encountered at the bottom of the waste-fill, just above the top of the residual soil.

The upper 5 to 10 feet of residual soil beneath the waste-fill was sampled at all boring locations except CA-2. Borings CA-3 through CA-8 encountered weathered limestone and residual soil of the Ponce formation. These soils are predominately orange and gray fine- to medium-sandy clays and silty fine- to medium-sands, with abundant fossils and fragments of limestone and calcarenite. At boring CA-7, the residual Ponce soils have been stained dark gray by leachate from the waste-fill. Boring CA-1 encountered the residual soils of the Juana Diaz formation. These soils are predominantly fine sandy silty clays and clayey find sands.

### 2.4.1 Results of Laboratory Analyses

Jar samples obtained during field investigation were shipped to Recra Research, Inc. in Amherst, N.Y. under USDA Permit #S-2563. At Recra Research the jar samples were visually examined and described for compositing purposes. The samples were then composited and shipped to Recra Environmental Laboratories in Tonawanda, N.Y. for analysis. The sample logs, composite identifications and a summary of analytical results are presented in Table 2. Laboratory analytical results and quality control data are presented in Appendix C-2.

The summary of analytical results presented in Table 2 show that the

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TABLE 2

SUMMARY ANALYTICAL RESULTS FOR CO-DISPOSAL AREA CONPOSITES

| Parameter | Unit of Measure | SAMPLE IDENTIFICATION | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | COMP-CD-2 | COMP-CD-4 | COMP-CD-6 | COMP-CD-8 | COMP-CD-9 | COMP-CD-10 | COMP-CD-11 | COMP-CD-12 | COMP-CD-13 | COMP-CD-14 | COMP-CD-15 | COMP-CD-16 |
| Chemical Oxygen Demand | g/g Dry | 5,700 | 7,800 | 9,000 | 21,500 | 55,300 | 27,100 | 53,300 | 11,700 | 163,000 | 12,800 | 24,700 | 4,010 |
| Total Recoverable Phenolics | g/g Dry | 2.27 | 2.03 | | 0.82 | | | 1.15 | 2.09 | 2.89 | | | |
| Total Recoverable Oil & Grease | g/gDry | 2,280 | 330 | 1,400 | 21,000 | 3,300 | 2,280 | 7,090 | 1,740 | 8,330 | 33,700 | 18,800 | 54,400 |
| Total Cyanide | g/g Dry | | 0.76 | 0.72 | 1.97 | 2.28 | | | | 0.93 | 0.77 | 1.43 | 1.22 |
| Total Barium | g/g Dry | 76 | 110 | 204 | 228 | 120 | 133 | 244 | 153 | 113 | 45 | | 250 |
| Total Zinc | g/g Dry | 34 | 204 | 24 | 46 | 149 | 50 | 72 | 84 | 52 | 24 | 42 | 4.7 |
| Halogenated Organic Scan (ECD) | * | | 0.76 | | 0.10 | 0.10 | | | | 0.23 | | | |
| Total Polychlorinated Biphenyls | ** | | 0.17<br>0.34<br>0.41 | | | | | | | | | | |

* ug/g dry as Chlorine; Lindane Standard

** ug/g dry as Aroclor 1242
ug/g dry as Aroclor 1260
ug/g dry Total

materials analyzed are representative of ordinary sanitary landfill wastes. From these data it is noted that total cyanide results for composite samples COMP-CD-8 and COMP-CD-9 are elevated with respect to the results for other composites. Total barium results for all samples are high. Polychlorinated biphenyls were detected in COMP-CD-4 at levels just above detection. This composite sample was obtained from materials sampled at boring CA-2, which was drilled in an area suspected of having received liquid wastes (based on aerial photographs).

## 2.5 Monitoring Well MW-5

The drilling and installation of monitoring well MW-5 were performed to assess potential hydraulic relationships between waste fill materials and underlying alluvial deposits. A review of historic aerial photographs indicated a generally north-south trending drainage feature once existed across the eastern portion of the site. The speculation was that alluvial materials associated with the drainage feature as well as the geometry of the drainage feature itself might provide a preferential lateral pathway for movement of waters which may have infiltrated the waste fill.

Using the aerial photography data, MW-5 was located in an area where alluvial materials were anticipated to be present and which corresponded to a topographically downgradient section of the former drainage feature. During drilling of MW-5, approximately forty-seven feet of waste and earthen fill were encountered. Five feet of alluvial materials were encountered underlying the fill. A five foot thickness of either colluvium or severely weathered Ponce Formation materials underlines the alluvium. It was not possible, based on split-spoon samples to determine whether this material was colluvium or severely weathered in-place Ponce Formation. The last eight feet of the borehole penetrated residual materials of the Ponce Formation.

Drilling, sampling, and well construction details for MW-5 are presented in the previously referenced Law Engineering report. Briefly, the borehole was advanced using hollow-stem augers until non-fill materials were encountered. Continuous split-spoon sampling was performed over the entire depth of drilling. When non-fill materials were encountered, 4-inch I.D. permanent steel casing was placed in the borehole and driven one foot into natural materials. The steel casing was then grouted into place. Once the grout had set, the borehole was advanced using air-rotary methods of drilling.

A monitoring well was then installed in the cased and open borehole. Slotted (0.01 inch) well screen was placed from 64 feet to 49 feet with riser pipe extending up to ground surface. The borehole and well remained dry throughout drilling and well placement and for some period of time following well completion. Drilling and well completion were performed over a period of time from July 21, 1983, to August 13, 1983.

By November of 1983, the well contained water and was sampled. Several periods of heavy rainfall occurred between August and November, 1983, and it is believed that the water in the well represented surface water which had infiltrated waste fill materials perculating downward into the alluvial materials and well screen. This conclusion is supported by water level data and recharge characteristics of the well noted during four sampling episodes which have occurred from November, 1983, through February of 1984. Water level data have been very eratic and appear to be related to periods of dry and rainy climatic conditions. The amount of recharge to the well during sampling activities has also been erratic and may be in part a function of the closeness in time of sampling to preceding rainfall events.

### 2.5.1 Results of Laboratory Analyses

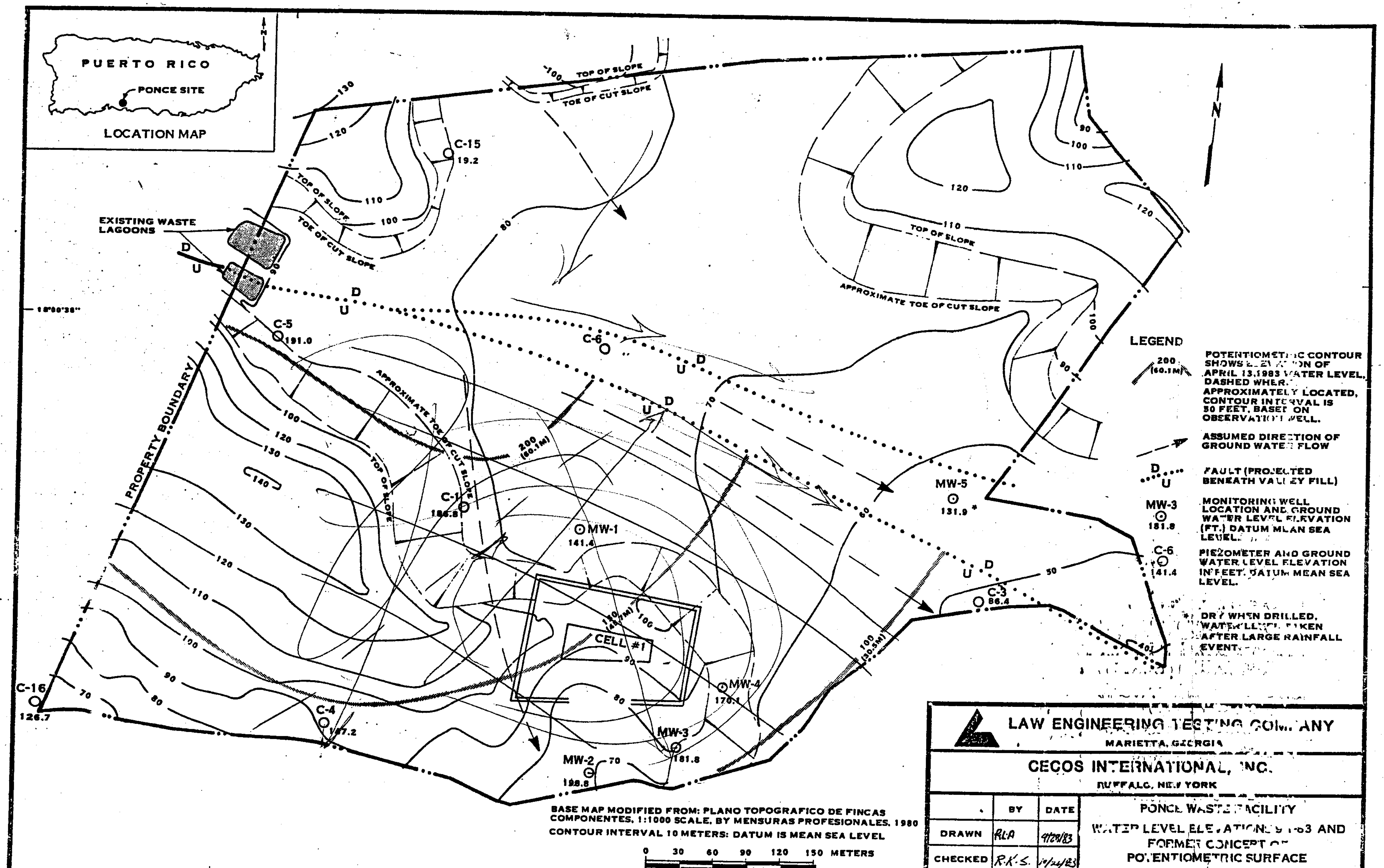
Analytical results for samples collected from monitoring well MW-5 are summarized in Table 3. Laboratory analytical results and quality control data are presented in Appendix C-3.

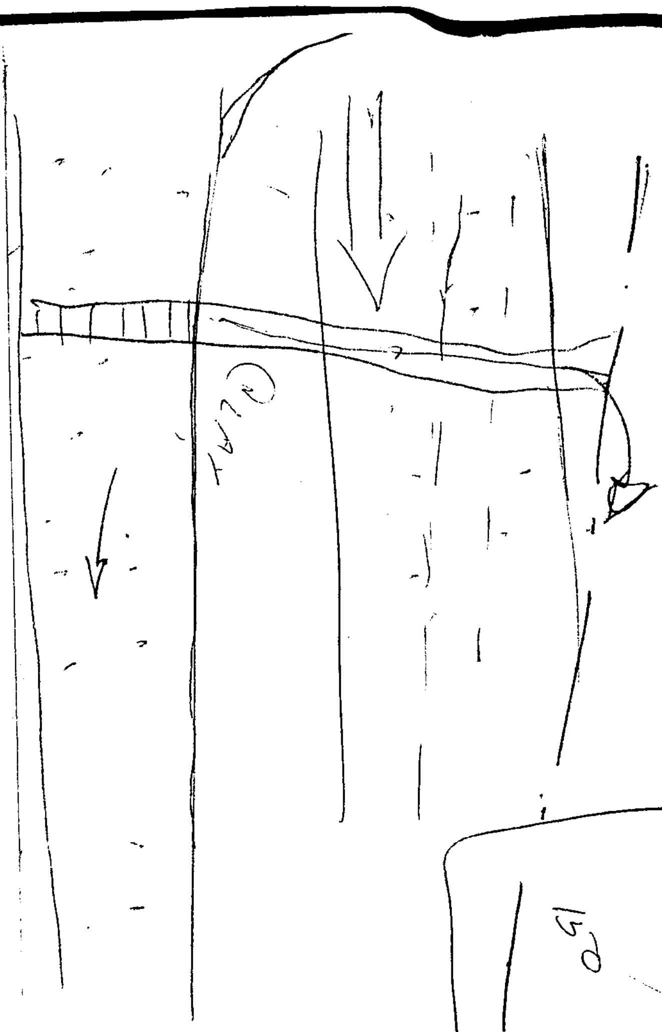
The laboratory results presented in Table 3 show that the quality of rainwater is affected as it percolates downward through waste fill materials. Increases in sodium, calcium, magnesium, potassium and chloride concentration are evident. The constituents detected in the samples do not indicate the presence of hazardous waste in the waste fill section at this location.

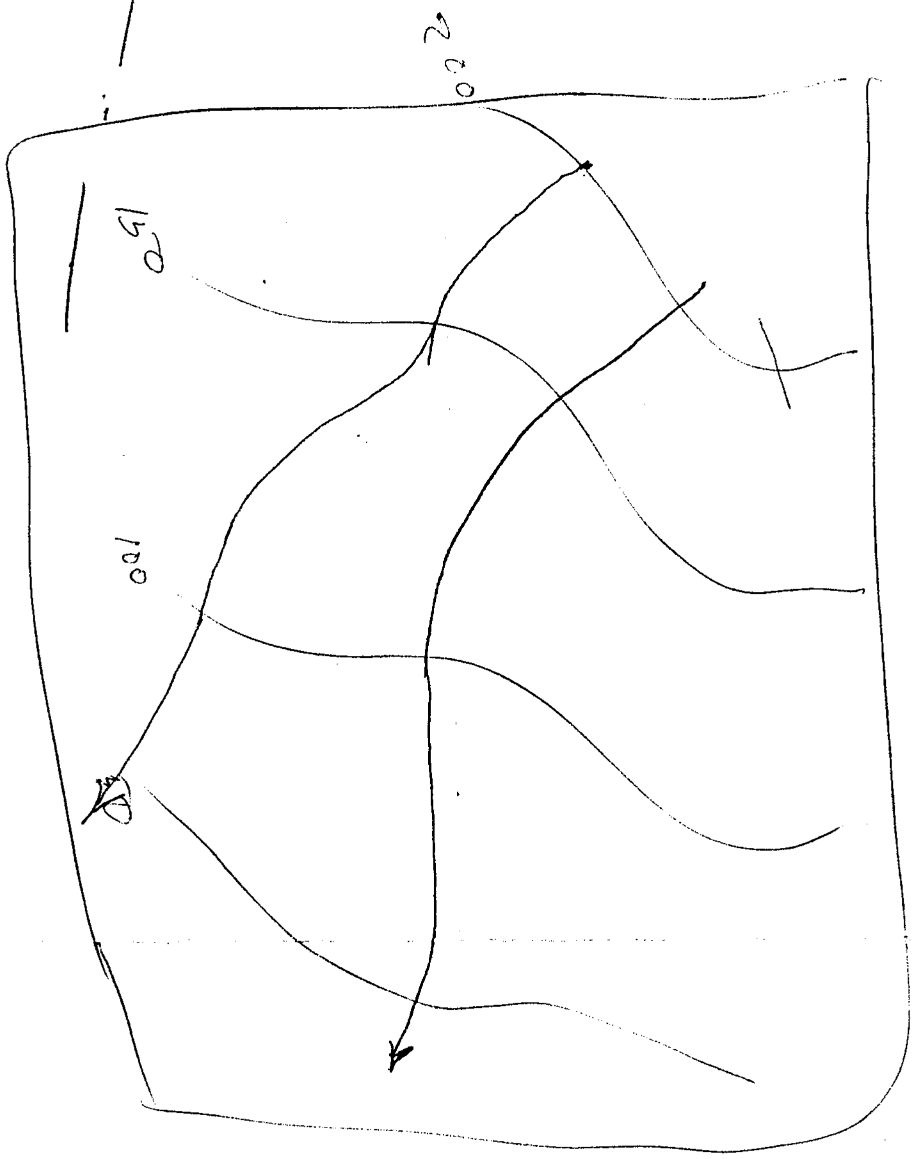
## 2.6 Roadway Excavation Sampling

Construction of site roadways required the excavation of waste fill materials. The general area where excavation took place is indicated by the shaded area shown on Figure 4. Waste fill materials were excavated down to residual materials.

During excavation, sidewall exposures of waste fill were logged and photographed in the field by a Recra Research waste specialist. At selected


PUERTO RICO
PONCE SITE
LOCATION MAP
N
EXISTING WASTE LAGOONS
TOP OF SLOPE
TOE OF CUT SLOPE
APPROXIMATE TOE OF CUT SLOPE
PROPERTY BOUNDARY
CELL #1
C-15 19.2
C-5 191.0
C-6
C-1 186.8
MW-1 141.4
MW-5 131.9
C-3 86.4
MW-4 170.1
MW-3 181.8
MW-2 128.8
C-4 187.2
C-16 126.7
200 (60.1M)
100 (30.5M)
LEGEND
ASSUMED DIRECTION OF GROUND WATER FLOW
FAULT (PROJECTED BENEATH VALLEY FILL)
MONITORING WELL LOCATION AND GROUND WATER LEVEL ELEVATION (FT.) DATUM MEAN SEA LEVEL.
PIEZOMETER AND GROUND WATER LEVEL ELEVATION IN FEET. DATUM MEAN SEA LEVEL.
DRY WHEN DRILLED, WATER LEVEL TAKEN AFTER LARGE RAINFALL EVENT.
BASE MAP MODIFIED FROM: PLANO TOPOGRAFICO DE FINCAS COMPONENTES, 1:1000 SCALE, BY MENSURAS PROFESIONALES, 1980
CONTOUR INTERVAL 10 METERS: DATUM IS MEAN SEA LEVEL
0 30 60 90 120 150 METERS
LAW ENGINEERING TESTING COMPANY
MARIETTA, GEORGIA
CECOS INTERNATIONAL, INC.
BUFFALO, NEW YORK
BY
DATE
DRAWN
RLA
4/28/83
CHECKED
R.K.S.
PONCE WASTE FACILITY
POTENTIOMETRIC SURFACE


CLAY


200
150

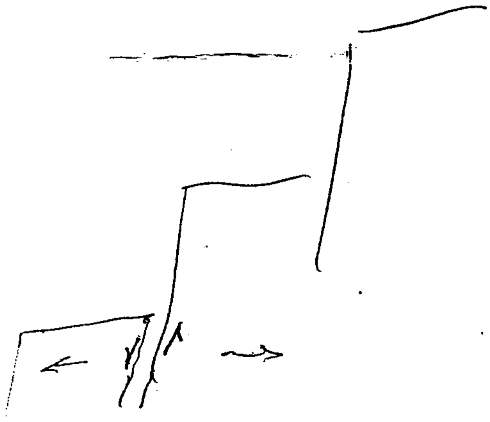


TABLE 3

SUMMARY OF ANALYTICAL RESULTS
FOR GROUNDWATER MONITORING
WELL-MW-5

| PARAMETERS | UNIT OF MEASURE | MW-5 (Date) | | |
|---|---|---|---|---|
| | | NOVEMBER 1983 | DECEMBER 1983 | MARCH 1984 |
| pH | Std. Unit | 6.86 | N/A | N/A |
| Specific Conduct | MHOS/CM | 20,500 | N/A | N/A |
| Chloride | mg/l | 8,000 | 8,510 | 8,560 |
| Sulfate | mg/l | 145 | 1,860 | 14 |
| Fluoride | mg/l | 0.84 | 0.64 | 0.62 |
| Total Organic Carbon | mg/l | 85 | 78 | 94 |
| T-Recoverable Phenolics | mg/l | <0.1 | 0.029 | 0.010 |
| T-Soluble Aluminum | mg/l | 0.22 | <0.2 | 0.45 |
| T-Soluble Barium | mg/l | 0.59 | 1.46 | 0.50 |
| T-Soluble Calcium | mg/l | 819 | 1,040 | <0.007 |
| T-Soluble Iron | mg/l | 1.2 | <0.03 | 1.1 |
| T-Soluble Magnesium | mg/l | 840 | 530 | 650 |
| T-Soluble Manganese | mg/l | 2.3 | 2.6 | 6.1 |
| T-Soluble Potassium | mg/l | 141 | 136 | 190 |
| T-Soluble Sodium | mg/l | 4,650 | 3,500 | 4,600 |
| T-Soluble Vanadium | mg/l | 5.8 | 5.6 | <0.12 |
| T-Soluble Chromium | mg/l | 0.014 | 0.004 | <0.008 |
| T-Soluble Silver | mg/l | <0.008 | 0.023 | <0.009 |
| T-Soluble Lead | mg/l | <0.001 | <0.001 | 0.11 |
| Nitrate | mg/l N/l | N/A | 0.31 | 4 |

TABLE 3
(continued)

SUMMARY OF ANALYTICAL RESULTS
FOR GROUNDWATER MONITORING
WELL-MW-5

| PARAMETERS | UNIT OF MEASURE | MW-5 (Date) | | |
|---|---|---|---|---|
| | | NOVEMBER 1983 | DECEMBER 1983 | MARCH 1984 |
| T-Soluble Antimony | mg/l | 0.033 | <0.01 | 0.007 |
| T-Soluble Cadium | mg/l | 0.039 | <0.007 | <0.007 |
| T-Soluble Copper | mg/l | 0.056 | 0.064 | 0.03 |
| T-Soluble Nickel | mg/l | 0.089 | 0.139 | 0.03 |
| T-Soluble Thallium | mg/l | 0.028 | <0.01 | 0.006 |
| T-Soluble Zinc | mg/l | 0.238 | 0.394 | 0.11 |
| T-Soluble Tin | mg/l | <0.1 | <0.1 | 7.0 |
| Total Organic Haldie | ug/l | 58 | 1600 | 902.5 |
| Gross α Radiation | pCi/l | 23±20 | <2 | <2 |
| Gross β Radiation | pCi/l | 4±2 | 7319 | 25±3 |
| Total Radiumdium | pCi/l | 4±2 | <1 | <1 |

TABLE 3
(continued)

SUMMARY OF ANALYTICAL RESULTS
FOR GROUNDWATER MONITORING
WELL-MW-5

| COMPOUND | UNIT OF MEASURE | MW-5 (Date) | | |
|---|---|---|---|---|
| | | NOVEMBER 1983 | DECEMBER 1983 | MARCH 1984 |
| Trans-1,2-Di-Chloroethylene* | ug/l | 22 | 22 | 25 |
| Aldrin** | ug/l | 0.05 | <0.1 | <0.1 |
| α -BHC** | ug/l | 0.30 | <0.1 | <0.1 |
| β -BHC** | ug/l | 0.37 | <0.1 | <0.1 |
| δ -BHC** | ug/l | 0.17 | 31 | <0.1 |
| γ -BHC** | ug/l | 0.08 | <0.1 | <0.1 |
| Dieldrin** | ug/l | 0.59 | <0.1 | <0.1 |
| α -Endosulfan** | ug/l | 0.11 | <0.1 | <0.1 |

* Detection limit for compound is 1.6 ug/l.

** Pesticides determined by GLC analysis above were not confirmed by GC/MS analysis. Refer to laboratory data in Appendix C-3.

locations samples of waste fill material were obtained. The samples were shipped to Recra Environmental Laboratories, Tonawanda, N.Y., for analysis of selected parameters. In the laboratory, field samples were composited for analysis.

Sidewall logs, identification of the vertical location of composite samples in sidewalls and laboratory analytical results and quality control data are presented in Appendix C-4.

### 2.6.1 Results of Laboratory Analyses

The analytical results shown on Table 4 indicate that none of the materials sampled would be classified as hazardous wastes. The results are not unusual for common sanitary landfill waste containing industrial residues. Differences within the data exist; several parameters detected in composite samples COMP-RW4 and COMP-RW5 are elevated with respect to results for the other composites. Given the methods of disposal common to sanitary landfills this variability in analytical results would be anticipated.

# TABLE 4

## SUMMARY OF ANALYTICAL RESULTS FOR THE ROADWAY SIDEWALL COMPOSITES

| Parameter | Unit of Measure | SAMPLE IDENTIFICATION | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | COMP-RW 1 | COMP-RW 2 | COMP-RW 3 | COMP-RW 4 | COMP-RW 5 | COMP-RW 6 | COMP-RW 7 | COMP-RW 8 | COMP-RW 9 |
| Total Cyanide | ug/g Dry | 1.5 | 2.0 | -- | 13 | 33 | 1.2 | 0.51 | 0.63 | -- |
| Leachable Organic Carbon | ug/g Dry | 490 | 830 | 420 | 1,300 | 2,500 | 470 | 810 | 380 | 400 |
| Leachable Sulfide | ug/g Dry | 36 | 400 | 180 | 1,370 | 1,330 | 140 | 51 | 210 | 1,200 |
| Halogenated Organic Scan (ECD) | ug/g Dry As Chlor. Lindane Std. | 0.1 | 0.20 | 0.13 | 1.0 | 23 | 0.12 | -- | 0.13 | 0.55 |
| EP Toxicity Test Extracts | | | | | | | | | | |
| Total Arsenic | mg/ℓ | 0.043 | 0.110 | 0.043 | 0.036 | 0.029 | 0.033 | 0.029 | 0.033 | 0.026 |
| Total Barium | mg/ℓ | 1.3 | 1.1 | 1.4 | 1.0 | 1.3 | 1.2 | 1.3 | 1.1 | 1.3 |
| Total Cadium | mg/ℓ | 0.009 | -- | -- | -- | -- | -- | -- | -- | -- |
| Total Chromium | mg/ℓ | 0.036 | 0.026 | 0.053 | -- | -- | 0.023 | -- | 0.060 | 0.028 |
| Total Lead | mg/ℓ | 0.095 | 0.064 | 0.100 | 0.036 | 0.088 | 0.023 | -- | 0.033 | 0.100 |

## 3.0 SUMMARY

The vertical and lateral boundaries of waste fill materials in the co-disposal area have been determined. The lateral boundaries a waste fill shown on Figures 3 and 4 from a large number of borings and results of a detailed geophysical investigation. The results from these two different investigative approaches are in close agreement and are supportive of each other.

Thickness of waste fill materials varies to a maximum of sixty-five feet. Thickest portions of waste fill occur in the central portion of the co-disposal area. Waste fill thins outward from this central high and is thinnest in areas adjacent to the surrounding hills.

Perched water occurs at random depths and locations within the waste fill. This water would be aniticpated to have dissolved constituents similar to the analytical results for MW-5.

Analytical results from composite samples, representing a broad areal coverage do not indicate hazardous wastes exist within the co-disposal area. Hazardous constituents have been detected in the analytical results but are present in concentrations considerably below what would constitute a hazardous waste. The analytical results are typical for sanitary landfill wastes where municipal and industrial residues have been co-disposed.

# APPENDIX

# APPENDIX A

## Geophysical Data

A-1 Seismic Refraction Data

A-2 Electrical Resisitivity Data

A-3 Electromagnetic Profiling Data

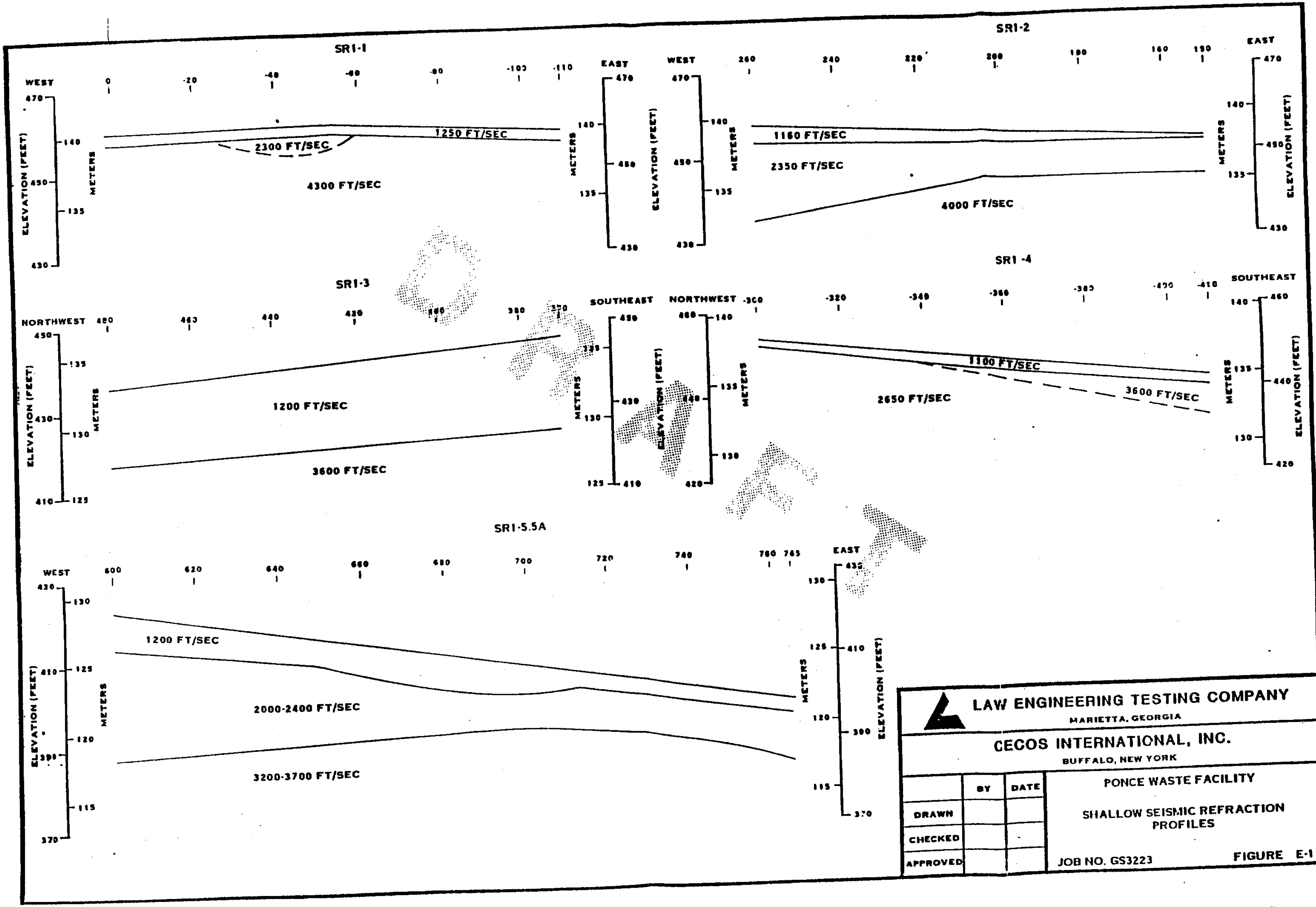
Seismic Refraction Data - Refraction line locations are shown on Figure 1. Five deep refraction lines with 25 to 50 foot geophone spacings were run. Three of these lines were run on the existing landfill and two were run on soil and rock on the southwesternmost hill on the site. Fourteen shallow refraction lines with geophone spacings of 7.5 to 15 feet were run. Seven were located on the existing landfill and 7 on the southwesternmost hill.

Seismic refraction provides information on the subsurface by measuring the velocity of elastic waves within the subsurface geologic units. The seismic velocities are determined by generating energy at the ground surface, some of which passes through the ground in the form of sound waves. The elastic waves are detected by geophones, electromagnetic transducers which respond to ground motion. The ground motion at each of the geophones, which are laid out at predetermined distances determined by the depth of interest, are transmitted to the seismograph which prints traces of the ground motion received at each geophone. The travel times of the elastic waves between the energy source and the geophones are determined from the seismograms and plotted versus the distance to the energy source. The time-distance spots are fitted with a series of straight lines based on the number of layers present. The inverse slope of the line is the apparent velocity of the corresponding layer. The velocities and position of the lines can be used to determine the depths and thicknesses of the layers.

Explosive charges, consisting of a two-component explosive and electric blasting cap, were used as the energy source for the deep refraction surveys. The energy source for the shallow refraction lines was a sledge hammer striking a metal plate. All refraction lines were recorded with a Geometrics Model 1210F signal enhancement seismograph.

Interpretation of refraction lines on the southwesternmost hill on the site provided estimates of the excavatibility of subsurface material. The lines located on the landfill provided information on the thickness of fill and the depth to rock. In addition, surface waves were recorded for a few of the shallow refraction lines on the fill for estimates of dynamic moduli. Figures E-1 through E-8 illustrate the interpretations of these seismic surveys.

Seismic refraction
data is unsatisfactory.
Must have the
TIME Vs DISTANCE PLOTS
for analysis.

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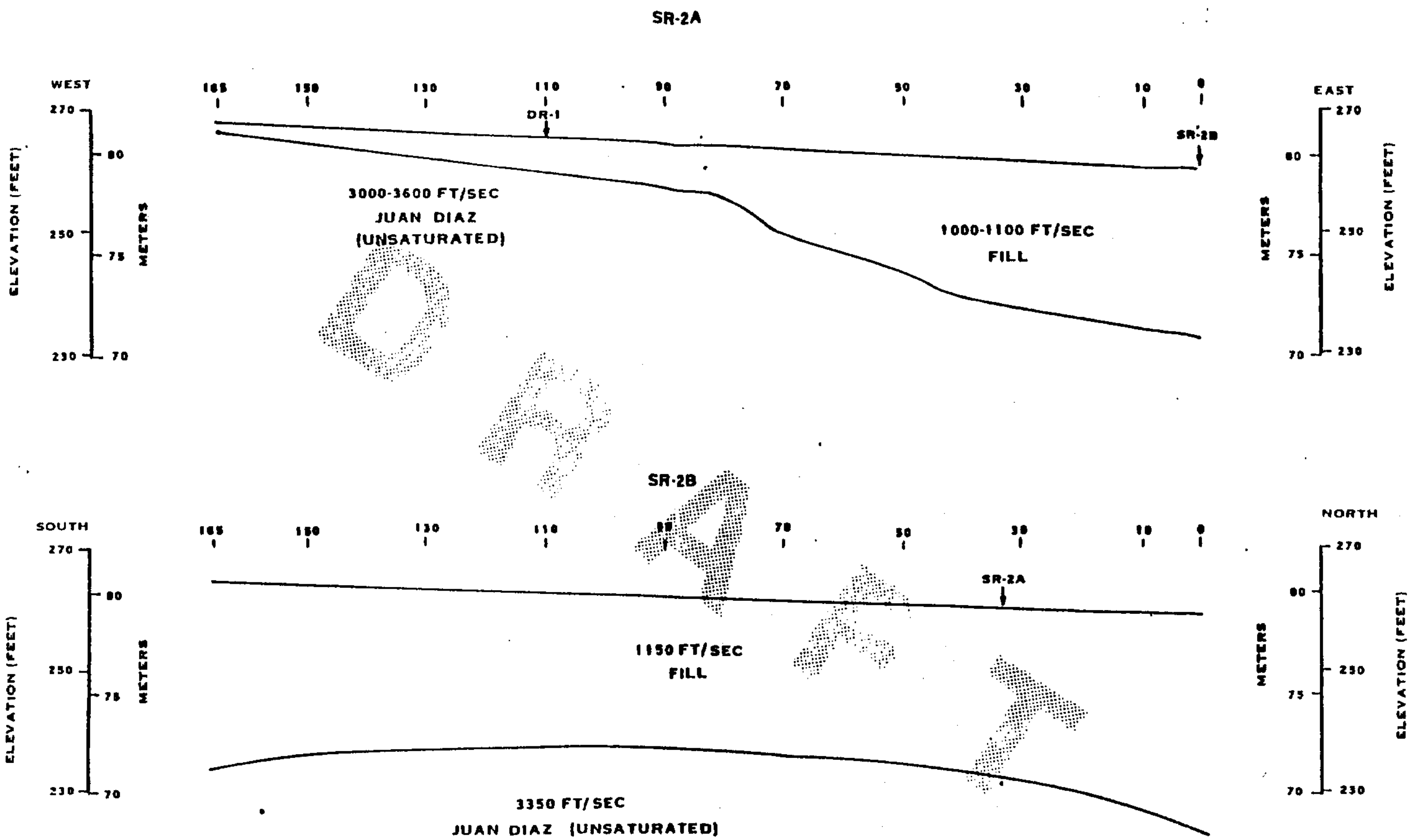
PONCE WASTE FACILITY

SHALLOW SEISMIC REFRACTION PROFILES

JOB NO. GS3223

FIGURE E-1

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SHALLOW SEISMIC REFRACTION PROFILES

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FIGURE E-2

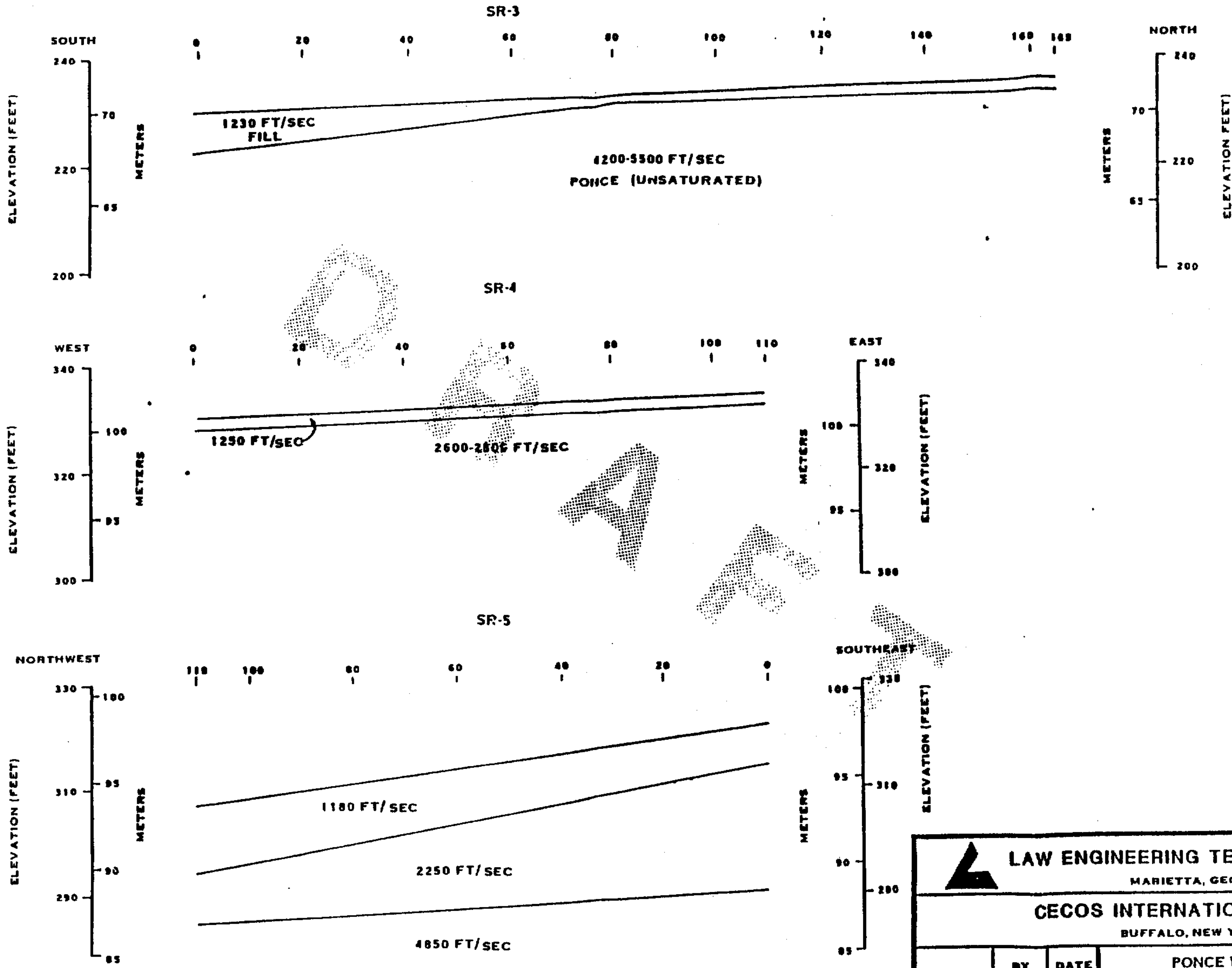




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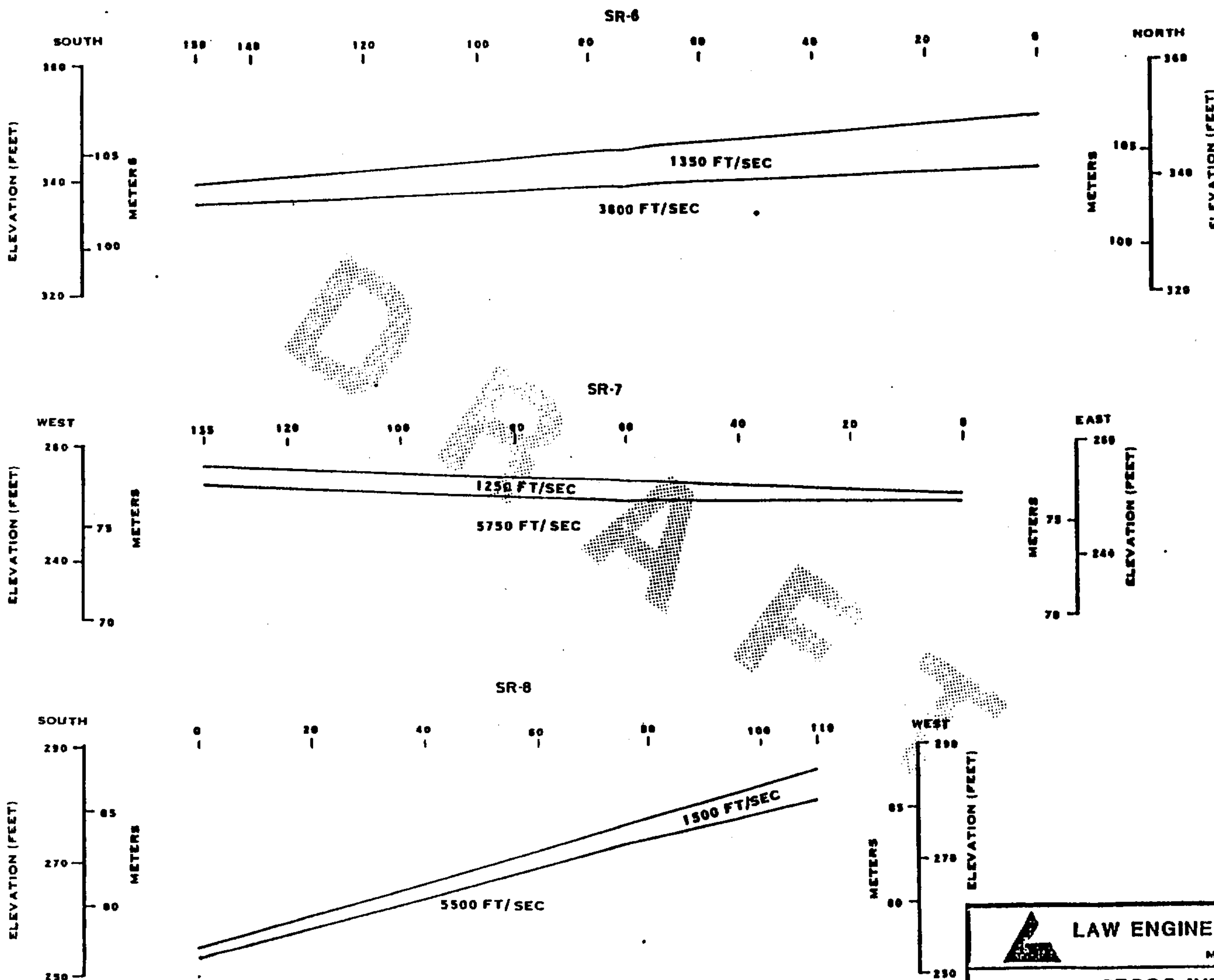
FIGURE E-3



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PONCE WASTE FACILITY

SHALLOW SEISMIC REFRACTION PROFILES

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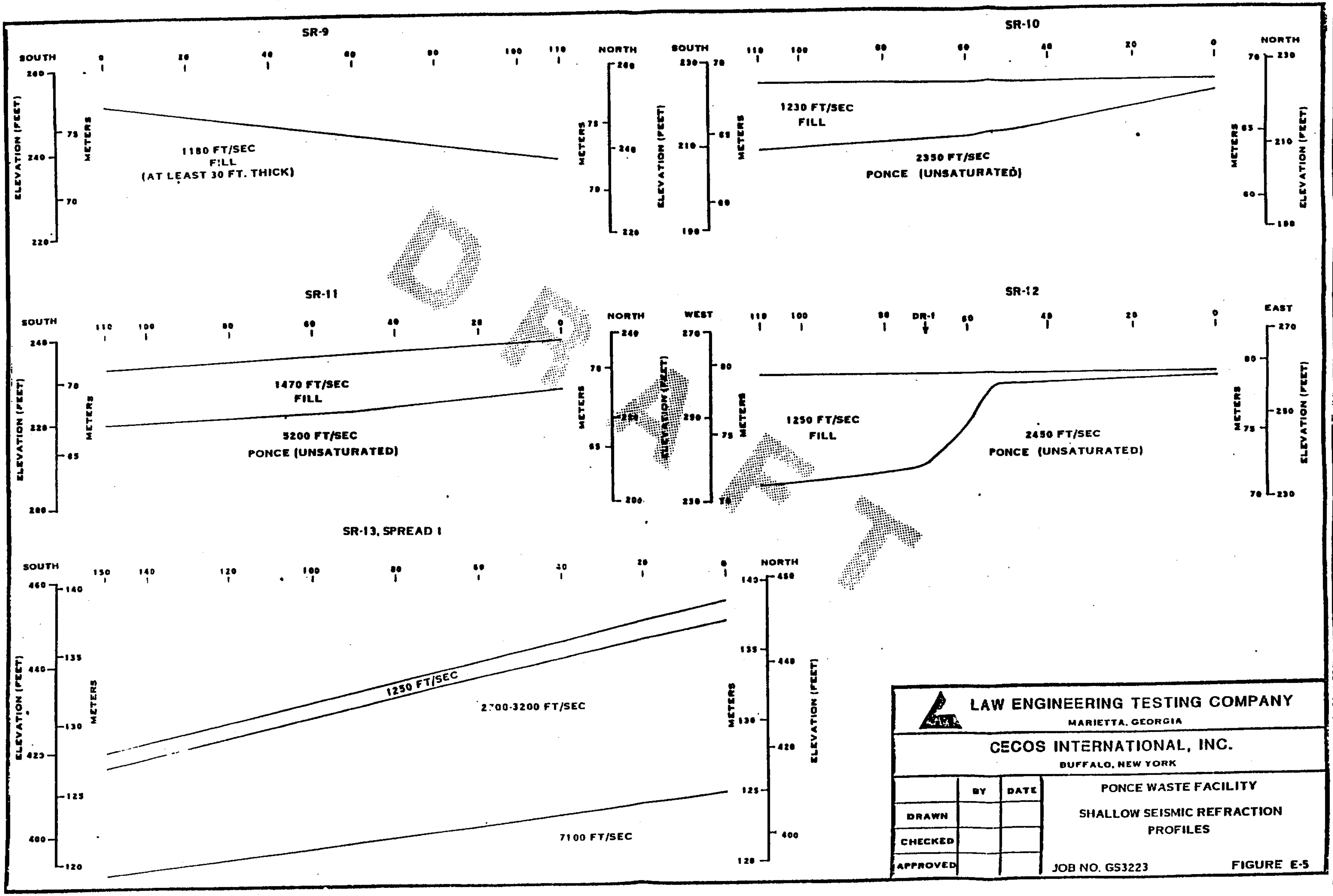
FIGURE E-4



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PONCE WASTE FACILITY

SHALLOW SEISMIC REFRACTION PROFILES

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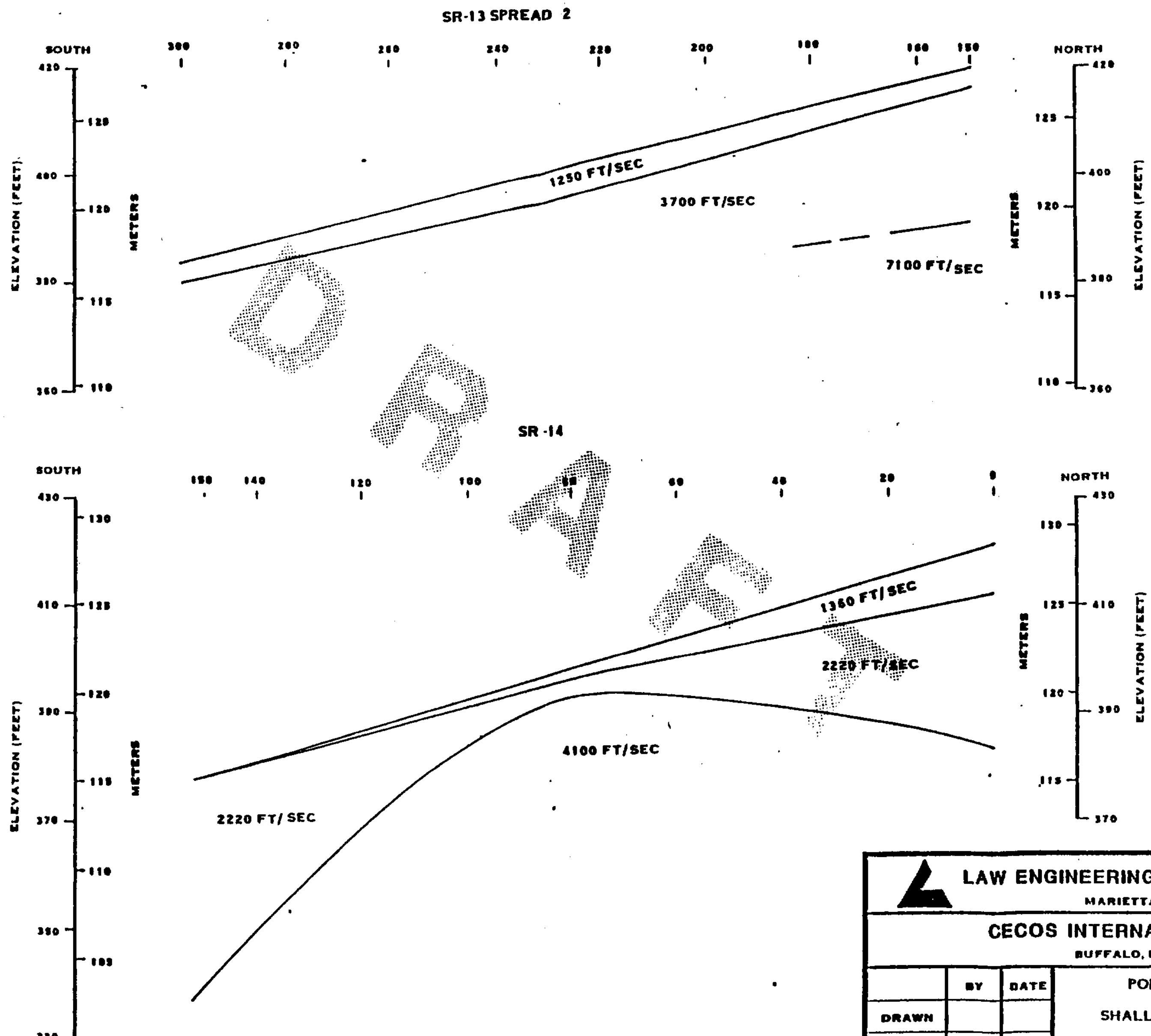
FIGURE E-5



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PONCE WASTE FACILITY

SHALLOW SEISMIC REFRACTION PROFILES

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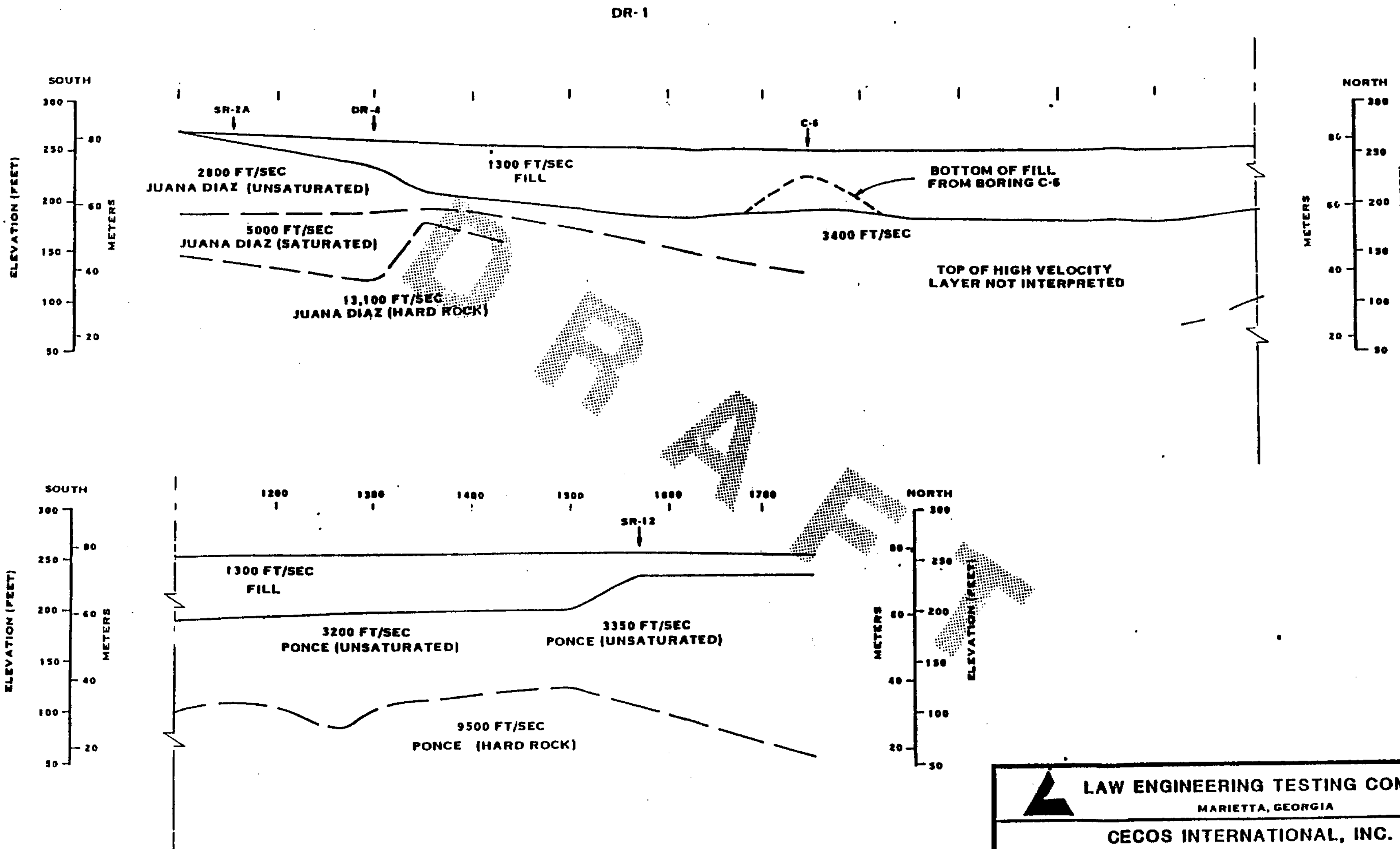
FIGURE E-6



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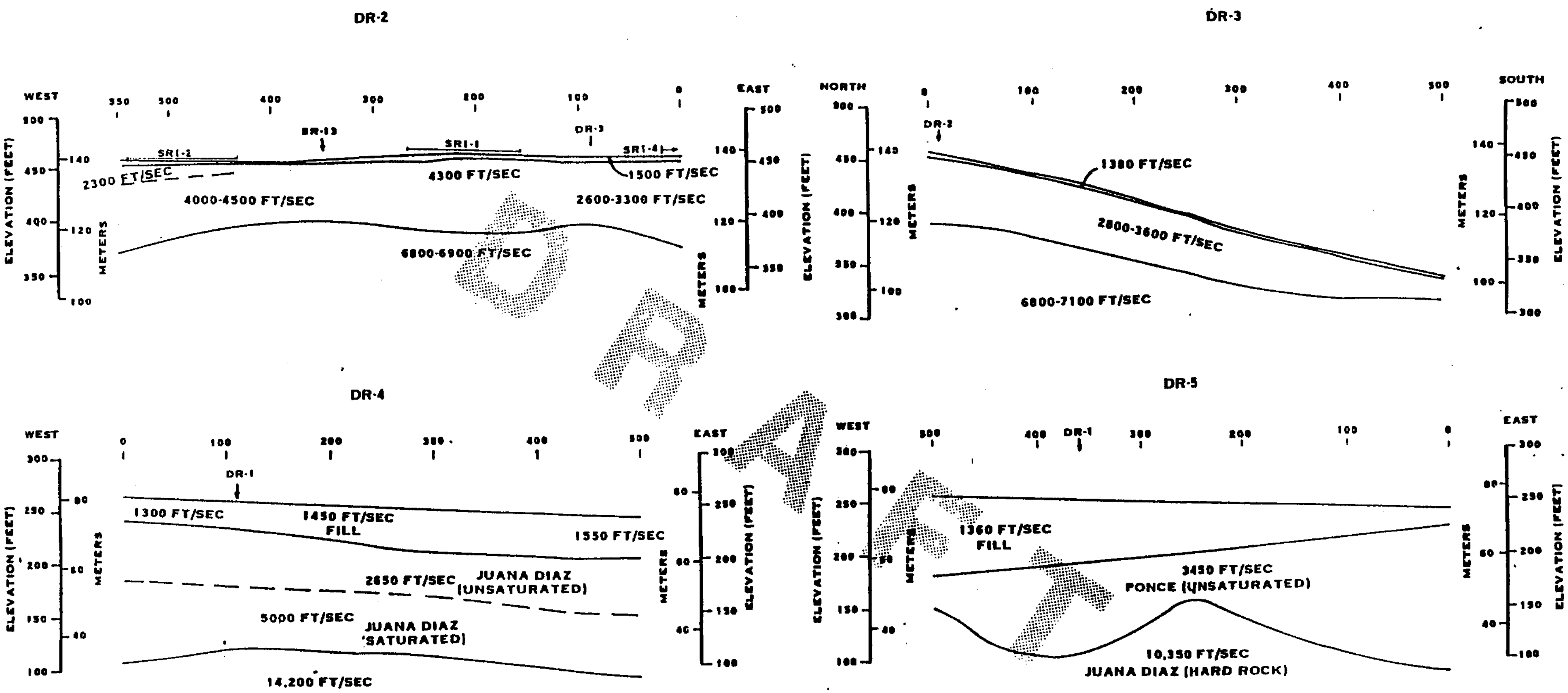
| DRAWN | | | DEEP SEISMIC REFRACTION PROFILES |
| CHECKED | | | |
| APPROVED | | | JOB NO. GS3223 FIGURE E-7 |

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PONCE WASTE FACILITY

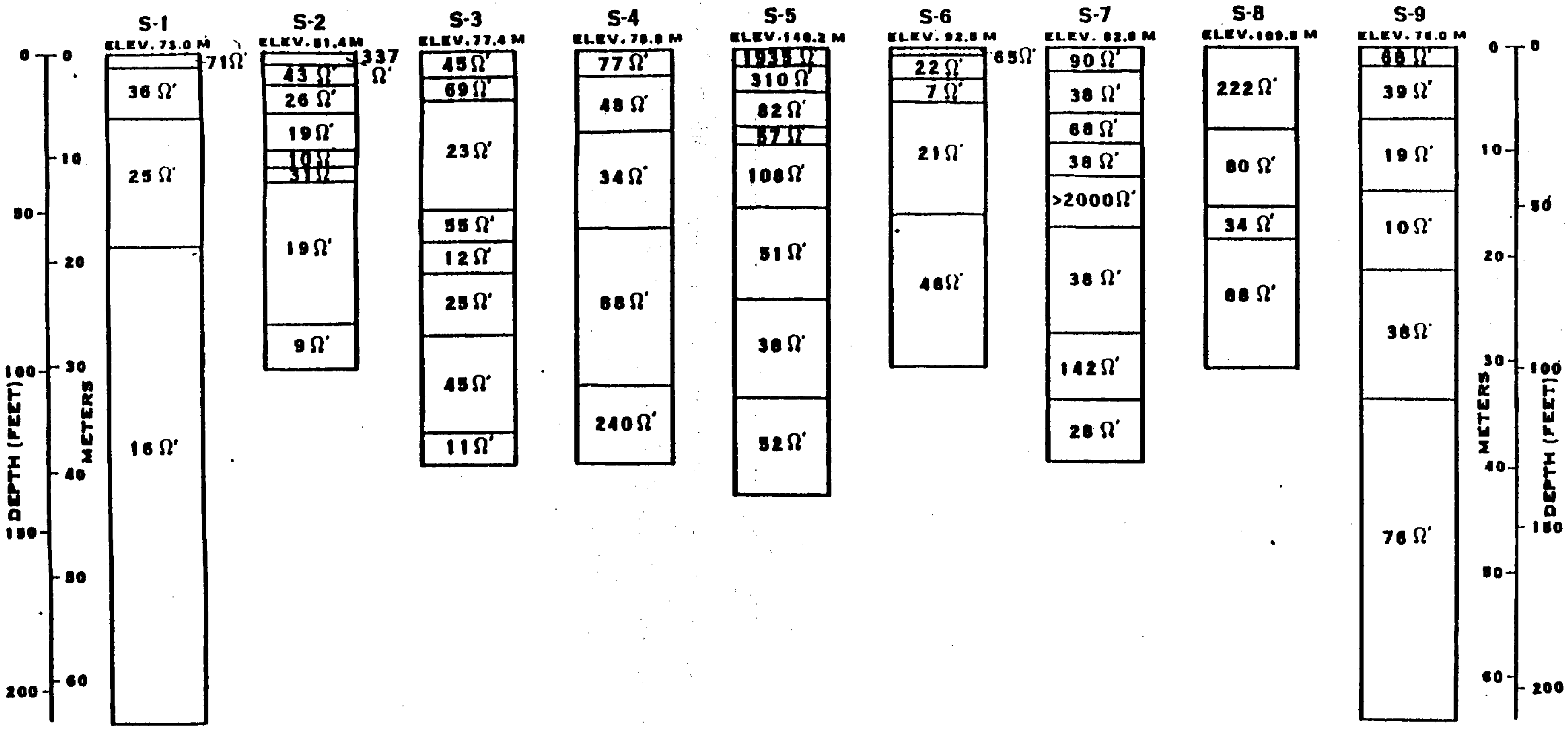
DEEP SEISMIC REFRACTION PROFILES

JOB NO. GS3223

FIGURE E-8

Electrical Resistivity Data - Resistivity soundings were made with an A.B.E.M. Terrameter at nine locations in the fill and in in-situ sediments on the surrounding hills. During electrical resistivity measurements an electric current is induced in the ground and the resultant potential difference between two points is measured. A four-electrode array is normally used; two electrodes apply current into the earth and two others measure the potential difference. The equipment is designed to determine the resistivity between the two potential electrodes, given the applied current and measured potential difference.

In vertical soundings the electrodes are in-line with each other and equally spaced. As the spacing is increased the effective depth of investigation is increassed in an approximate 1:1 ratio. For this study, spacings were incrementally increased from 5 to 200 feet. Interpretations were performed using the inverse-slope method. The following pseudologs illustrate the interpretations of the electrical resistivity surveys.




NOTES: ALL RESISTIVITIES ARE IN OHM - FEET.
FOR SOUNDING LOCATIONS
SEE FIGURE 7.

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PONCE WASTE FACILITY

PSEUDOLOGS OF ELECTRICAL RESISTIVITY SOUNDINGS

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| CHECKED | NLP | [illegible] |
| APPROVED | LSI | [illegible] |

JOB NO. GS3223

FIGURE D-1

Electromagnetic Profiling - Electromagnetic profiling was performed on two long lines across the fill area (lines L-1 and L-2) and on 11 shorter lines extending from the slopes of excavation cuts across the fill (Figure 1). A Geonics Model EM34 was used with coil spacings of 33 and 66 feet. These coil spacings are used to obtain subsurface penetration of 25 to 100 feet. Electromagnetic measurements are made by creating a magnetic field in the transmitter coil which sets up an electric current in the ground, which in turn disturbs a reference field in the receiver coil. A total of approximately 7,300 lineal feet were profiled. Variations in the apparent conductivity of the subsurface allowed delineation of areas of little or no fill from areas of thick fill on a qualitative basis.

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BY TCH DATE 22 AUG 84 CK ________ DATE 10 ___ 84 SHEET ___ OF ___